



Standard Guide for Sampling, Test Methods, Specifications, and Guide for Electrical Insulating Oils of Petroleum Origin ¹

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This standard has been approved for use by agencies of the Department of Defense. Consult the DoD Index of Specifications and Standards for the specific year of issue which has been adopted by the Department of Defense.

1. Scope

1.1 This guide describes methods of testing and specifications for electrical insulating oils of petroleum origin intended for use in electrical cables, transformers, oil circuit breakers, and other electrical apparatus where the oils are used as insulating, or heat transfer media, or both.

1.2 The purpose of this guide is to outline the applicability of the available test methods. Where more than one is available for measuring a given property, their relative advantages are described, along with an indication of laboratory convenience, precision, (95 % confidence limits), and applicability to specific types of electrical insulating oils.

1.3 The guide is classified into the following categories: Sampling, Physical Tests, Electrical Tests, Chemical Tests, Specifications, and Guide. Within each test category, the test methods are listed alphabetically by property measured. A list of standards follows:

Category	Section	ASTM Method
<i>Sampling:</i>	3	D923, D2759, D3305, D3613
<i>Physical Tests:</i>		
Aniline Point	4	D 611
Coefficient of Thermal Expansion	5	D 1903
Color	6	D 1500
Examination: Visual Infrared	7	D 1524, D2144
Flash and Fire Point	8	D 92
Interfacial Tension	9	D 971, D2285
Pour Point of Petroleum Products	10	D 97
Refractive Index	11	D 1218, D1807
Relative Density (Specific Gravity)	12	D 287, D1250, D1298, D1481
Specific Heat	13	D 2766
Thermal Conductivity	14	D 2717
Viscosity	15	D 88, D445, D2161
<i>Electrical Tests:</i>		
Dielectric Breakdown Voltage	16	D 877, D1816, D3300
Dissipation Factor and Relative Permittivity (Dielectric Constant)	17	D 924
Gas Evolution	18	D 2300
Resistivity	19	D 1169

Category	Section	ASTM Method
<i>Chemical Tests:</i>		
Acidity, Approximate	20	D 1534
Carbon-Type Composition	21	D 2140
Compatibility with Construction Material	22	D 3455
Copper Content	23	D 3635
Gas Analysis	24	D 3612
Gas Content	25	D 831, D1827, D2945
Inorganic Chlorides and Sulfates	26	D 878
Neutralization (Acid and Base) Numbers	27	D 664, D974
Oxidation Inhibitor Content	28	D 2668, D4768
Oxidation Stability	29	D 1934, D2112, D2440
Polychlorinated Biphenyl Content	30	D 4059
Sediment and Soluble Sludge	31	D 1698
Sulfur, Corrosive	32	D 1275
Water Content	33	D 1533
<i>Specification:</i>		
Mineral Insulating Oil for Electrical Apparatus	34	D 3487
<i>Guide:</i>		
High Firepoint Electrical Insulating Oils	35	D 5222

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 ASTM Standards:

- D 88 Test Method for Saybolt Viscosity ²
- D 92 Test Method for Flash and Fire Points by Cleveland Open Cup ³
- D 97 Test Method for Pour Point of Petroleum Products ³
- D 287 Test Method for API Gravity of Crude Petroleum and Petroleum Products (Hydrometer Method) ³
- D 445 Test Method for Kinematic Viscosity of Transparent and Opaque Liquids (and the Calculation of Dynamic Viscosity) ³
- D 611 Test Methods for Aniline Point and Mixed Aniline Point of Petroleum Products and Hydrocarbon Solvents ³

¹ This guide is under the jurisdiction of ASTM Committee D-27 on Electrical Insulating Liquids and Gases, and is the direct responsibility of Subcommittee D27.01 on Mineral Oils.

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² Annual Book of ASTM Standards, Vol 04.04.

³ Annual Book of ASTM Standards, Vol 05.01.